ABSTRACT OF THE DISCLOSURE

An on-signal calibration system I and Q signals of a transmitter to remove distortions in the RF output signal. The transmitter generates I and Q values and converts, modulates and combines the I and Q values into the RF output signal for transmission. The calibration system includes a detector, a sampler, a selector, an imbalance estimator, and an IQ corrector. The detector senses the RF output signal and provides a detection signal indicative thereof. The sampler samples the detection signal and provides digital samples. The selector selects from among the digital samples that correspond to predetermined ranges of the I and Q values, or otherwise predetermined selection boxes at predetermined phases. The imbalance estimator determines at least one imbalance estimate based on selected digital samples. The IQ corrector corrects the I and Q values using at least one imbalance estimate.